

AMENDMENTS TO THE CLAIMS

1. (Original) A method of manufacturing electronic circuits comprising:
generating CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and
employing said CAD data, said bill of materials and said approved component vendor list for automatically generating:
a pick & place machine-specific component loading specification;
a pick & place machine-specific component placement sequence; and
pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line.
2. (Original) A method of manufacturing electronic circuits according to claim 1 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine specific component data for governing the operation of at least one specific pick & place machine includes:
automatically generating said pick & place machine-specific component data by employing a first database containing at least one of pick & place machine-independent, geometric component data and pick & place machine-independent, component supply data and a second database containing machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data.
3. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of the preceding claims 1~~ and wherein said pick & place machine specific component data for governing the operation of at least one specific pick & place machine comprises at least one of pick & place machine-specific component shape parameters and pick & place machine-specific component supply parameters.

4. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of the preceding~~ claims 1 and wherein said automatically generating pick & place machine-specific component data comprises automatically generating a third database containing at least:

a mapping between component identifiers and pick & place machine-specific component shape parameters; and

a mapping between said component identifiers and pick & place machine-specific component supply parameters.

5. (Original) A method of manufacturing electronic circuits according to claim 4 and wherein said mapping between component identifiers and pick & place machine-specific component shape parameters comprises:

a mapping of PCNs to component shape identifiers; and

a mapping of component shape identifiers to pick & place machine-specific component shape parameters.

6. (Original) A method of manufacturing electronic circuits according to claim 5 and wherein said component shape identifiers are pick & place machine-specific component shape identifiers.

7. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 4—6~~ and wherein said mapping between said component identifiers and pick & place machine-specific component supply parameters comprises: a mapping of PCNs to component supply identifiers; and

a mapping of component supply identifiers to pick & place machine-specific component supply parameters.

8. (Original) A method of manufacturing electronic circuits according to claim 7 and wherein said component supply identifiers are pick & place machine-specific component supply identifiers.

9. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 4 –8~~ and wherein said pick & place machine-specific component shape parameters include at least one of:

- component geometry parameters;
- component handling parameters;
- component imaging parameters;
- component recognition tolerances; and
- pick & place machine-specific procedures.

10. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 4 –9~~ and wherein said pick & place machine-specific component shape parameters include at least one of:

- component geometry parameters in pick & place machine-specific syntax;
- pick & place machine-specific component handling parameters;
- pick & place machine-specific component imaging parameters;
- pick & place machine-specific component recognition tolerances; and
- pick & place machine-specific procedures.

11. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 4 –10~~ and wherein said pick & place machine-specific component supply parameters include at least one of:

- a component carrier type; and
- pick & place machine-specific, component carrier-specific parameters.

12. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of the preceding~~ claims 1 and wherein at least part of said pick & place machine-specific component data comprises adaptive pick & place machine-specific component data.

13. (Original) A method of manufacturing electronic circuits according to claim 12 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component shape data.

14. (Original) A method of manufacturing electronic circuits according to claim 12 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component supply data.

15. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of~~ claims 2 ~~—14~~ and wherein said first database comprises at least one of:

- a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);
- a mapping of CV/Cat#s to component supply form parameters (CCSL);
- a mapping of PCNs to component supply form parameters (UMCSL);
- a mapping of PCNs to CV/Cat#s (MCVL);
- a mapping of DCN to PCN;
- a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and
- a mapping of PCN to generic component geometric parameters.

16. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of~~ claims 2 ~~—15~~ and wherein said second database comprises at least one of:

- a mapping of component manufacturer-independent component characteristics to rules for generating pick & place machine-specific component shape parameters; and

a mapping of component manufacturer-independent component supply form characteristics to rules for generating pick & place machine-specific component supply parameters.

17. (Original) A method of manufacturing electronic circuits according to claim 16 and wherein said rules for generating pick & place machine-specific component shape parameters include rules for generating at least one of:

- component geometric parameters in pick & place machine specific syntax;
- pick & place machine specific component handling parameters;
- pick & place machine specific component imaging parameters;
- pick & place machine specific component recognition tolerances; and
- pick & place machine specific procedures.

18. (Currently Amended) A method of manufacturing electronic circuits according to claim 16 ~~or claim 17~~ and wherein said rules for generating pick & place machine-specific component supply parameters include rules for generating at least one of:

- a component carrier type in pick & place machine-specific syntax; and
- component carrier type-specific parameters in pick & place machine-specific syntax.

19. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 16 —18~~ and wherein said second database comprises at least one of:

- a mapping of component manufacturer-independent component characteristics to rules for generating adaptive pick & place machine-specific component shape parameters; and
- a mapping of component manufacturer-independent component supply form characteristics to rules for generating adaptive pick & place machine-specific component supply parameters.

20. (Original) A method of manufacturing electronic circuits according to claim 19 and

wherein said rules for generating adaptive pick & place machine-specific component shape parameters include rules for generating at least one of:

component geometric parameters in pick & place machine specific syntax;
adaptive pick & place machine specific component handling parameters;
adaptive pick & place machine specific component imaging parameters;
adaptive pick & place machine specific component recognition tolerances; and
pick & place machine specific procedures.

21. (Currently Amended) A method of manufacturing electronic circuits according to claim 19 ~~or claim 20~~ and wherein said rules for generating adaptive pick & place machine-specific component supply parameters include rules for generating at least one of:

adaptive component carrier type in pick & place machine-specific syntax; and
adaptive component carrier type-specific parameters in pick & place machine-specific syntax.

22. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 16 — 21~~ and wherein said second database is operator modifiable.

23. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of the preceding~~ claims 1 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine specific component data for governing the operation of at least one specific pick & place machine includes:

automatically generating said pick & place machine-specific component data by employing a fourth database containing pick & place line and machine configurations.

24. (Original) A method of manufacturing electronic circuits according to claim 23 and wherein said fourth database comprises at least one of:

pick & place machine configurations;

ordered listings of pick & place machines in at least one machine line; and
pick & place machine configurations of said pick & place machines in said at least one machine line.

25. (Original) A method of manufacturing electronic circuits according to claim 24 and wherein said pick & place machine configurations include at least one of:

- camera types and characteristics;
- illumination types and characteristics;
- component feeder carriage types and characteristics;
- component feeder types and characteristics;
- nozzle types and characteristics; and
- kinetic characteristics of moving elements.

26. (Currently Amended) A method of manufacturing electronic circuits according to ~~either of claims 24 and 25~~ and wherein said pick & place machine configurations of said pick & place machines in said plurality of machine lines include at least one of:

- mounted camera types;
- mounted illumination types;
- mounted component feeder carriages;
- mounted component feeders; and
- mounted nozzles.

27. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 2 — 26~~ and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine-specific component loading specification, pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line comprises:

employing said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components; and

employing said first database and said second database to auto-generate said pick & place machine specific component data.

28. (Original) A method of manufacturing electronic circuits according to claim 27 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine-specific component loading specification, pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line also comprises:

prior to said employing said CAD data said bill of materials, said approved component vendor list and said first database to search for component data for new components, employing said CAD data, said bill of materials and said approved component vendor list to form combined printed circuit assembly data;

following said employing said first database and said second database, selecting a pick & place machine line;

thereafter, employing said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line; and

thereafter, employing a computer to provide said pick & place machine-specific component loading specification, said pick & place machine-specific component placement sequence and said pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line to at least one pick & place machine in said pick & place machine line.

29. (Original) A method of manufacturing electronic circuits according to claim 28, and wherein said combined printed circuit assembly data employs PCN designations.

30. (Currently Amended) A method of manufacturing electronic circuits according to claim 28 ~~or claim 29~~ and wherein said employing said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components comprises employing said combined printed circuit assembly data and said first database to search for said component data for new components.

31. (Original) A method of manufacturing electronic circuits according to claim 30 and wherein said employing said combined printed circuit assembly data and said first database to search for component data for new components comprises:

searching said first database for pick & place machine independent component supply data for said new components; and

searching said first database for pick & place machine independent geometric component data for said new components.

32. (Original) A method of manufacturing electronic circuits according to claim 31 and wherein said searching said first database for pick & place machine independent component supply data for said new components comprises:

selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available;

obtaining a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which CSF parameters are not available; and

employing said CV/CAT# to search at least part of said first database for corresponding CSF parameters.

33. (Original) A method of manufacturing electronic circuits according to claim 32 and also comprising employing said CV/CAT# to search at least part of said first database for corresponding default CSF parameters.

34. (Currently Amended) A method of manufacturing electronic circuits according to ~~either of claims 32 and 33~~ and also comprising employing said at least one PCN to search at least part of said first database for at least one corresponding set of default CSF parameters.

35. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 32 —34~~ and also comprising:

presenting said at least one corresponding set of default CSF parameters and said at least one PCN to an operator for selection of an appropriate set of CSF parameters.

36. (Original) A method of manufacturing electronic circuits according to claim 35 and also comprising, following said presenting:

automatically adding said appropriate set of CSF parameters as CSF parameters to said first database for said at least one PCN; and

automatically adding said appropriate set of CSF parameters as default CSF parameters to said first database for CV/CAT#s corresponding to said at least one PCN.

37. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 32 —34~~ and also comprising:

providing manually generated CSF parameters for said at least one PCN;

automatically adding said manually generated CSF parameters to said first database for said at least one PCN; and

automatically adding said manually generated CSF parameters as default CSF parameters to said first database for CV/CAT#s corresponding to said at least one PCN.

38. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 32 —37~~ and wherein said selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data which does not have CSF parameters.

39. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 32 —37~~ and wherein said selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data for which there are no pick & place machine specific component supply parameters.

40. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 31 —39~~ and wherein said searching said first database for pick & place machine independent component supply data for said new components comprises:

selecting at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

obtaining a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

employing said CV/CAT# to search at least part of said first database for corresponding GCG parameters.

41. (Original) A method of manufacturing electronic circuits according to claim 40 and wherein said employing said CV/CAT# also comprises:

automatically adding said corresponding GCG parameters to said first database for said CV/CAT#; and

automatically adding said corresponding GCG parameters to said first database for other CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available.

42. (Original) A method of manufacturing electronic circuits according to claim 40 and also comprising, following said employing said CV/CAT#, conducting a proximity search including:

searching said first database for at least one additional PCN having at least one corresponding CV/CAT#, which is different from said CV/CAT#, in common with said at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

searching said first database for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

employing said at least one different CV/CAT# to search at least part of said first database for GCG parameters corresponding to said at least one different CV/CAT#.

43. (Original) A method of manufacturing electronic circuits according to claim 42 and also comprising:

presenting said GCG parameters corresponding to said at least one different CV/CAT# and said at least one PCN corresponding to ones of said new components for which GCG parameters are not available to an operator for approval.

44. (Original) A method of manufacturing electronic circuits according to claim 43 and also comprising:

automatically adding said GCG parameters corresponding to said at least one different CV/CAT# to said first database as GCG parameters corresponding to CV/CAT#s corresponding to at least one of said at least one PCN corresponding to ones of said new components for which GCG parameters are not available and said at least one additional PCN; and

automatically indicating, for all CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available, said GCG parameters as being obtained by said proximity search.

45. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 40 –43~~ and also comprising:

providing manually generated GCG parameters for said CV/CAT#;

automatically adding said manually generated GCG parameters to said first database for said CV/CAT#; and

automatically adding said manually generated GCG parameters to said first database for CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available.

46. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 40 –45~~ and wherein said selecting at least one PCN corresponding to ones of said new components for which GCG parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data which does not have GCG parameters.

47. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 40 –45~~ and wherein said selecting at least one PCN corresponding to ones of said new components for which GCG parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data for which there are no pick & place machine specific component shape parameters.

48. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 28 –47~~ and wherein said employing said first database and said second database to auto-generate said pick & place machine specific component data comprises:

employing said pick & place machine independent component supply data and said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data to auto-generate pick & place machine specific component supply parameters; and

employing said pick & place machine independent geometric component data and said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data to auto-generate pick & place machine specific component shape parameters.

49. (Original) A method of manufacturing electronic circuits according to claim 48 and wherein said employing said pick & place machine independent component supply data comprises:

for a specific pick & place machine in said pick & place machine line, selecting at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

employing at least one generic component supply identifier to obtain CSF parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

employing at least part of said CSF parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said CSF parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

50. (Original) A method of manufacturing electronic circuits according to claim 49 and also comprising, prior to said employing at least part of said CSF parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules, employing at least part of said CSF parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

51. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of claims 48 —50~~ and wherein said employing said pick & place machine independent geometric component data comprises:

for a specific pick & place machine in said pick & place machine line, selecting at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

employing at least one generic component shape identifier to obtain GCG parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

employing at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said GCG parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

52. (Original) A method of manufacturing electronic circuits according to claim 51 and also comprising, prior to said employing at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules, employing at least part of said GCG parameters to auto-generate said corresponding pick & place machine specific component shape identifier.

53. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of~~ claims 27 —52—and also comprising, prior to said employing said CAD data, said bill of materials, said approved component vendor list and said first database, automatically populating a CCL portion of said first database.

54. (Original) A method of manufacturing electronic circuits according to claim 53 and wherein said automatically populating comprises employing a component library which maps CV/CAT#s to component packaging shape parameters.

55. (Original) A method of manufacturing electronic circuits according to claim 54 and wherein said employing a component library comprises employing said component library which includes:

a first stage mapping which maps CV/CAT#s to component packaging shape identifiers; and

a second stage mapping which maps said component packaging shape identifiers to component packaging shape parameters.

56. (Original) A method of manufacturing electronic circuits according to claim 55 and wherein said automatically populating comprises:

obtaining at least one CV/CAT# for which no mapping exists in said CCL portion;

employing said first stage mapping to obtain a component packaging shape identifier corresponding to said at least one CV/CAT#;

employing said second stage mapping to obtain component packaging shape parameters corresponding to said component packaging shape identifier corresponding to said at least one CV/CAT#;

employing said component packaging shape identifier corresponding to said at least one CV/CAT#; and said component packaging shape parameters corresponding to said component packaging shape identifier to provide an auto-generated generic component shape identifier and auto-generated GCG parameters; and

adding said auto-generated generic component shape identifier and said auto-generated GCG parameters to said CCL portion for said at least one CV/CAT#.

57. (Original) A method of manufacturing electronic circuits according to claim 56 and wherein said automatically populating also comprises, prior to said adding:

employing said auto-generated generic component shape identifier to search said CCL portion for corresponding, previously generated GCG parameters;

comparing said previously generated GCG parameters and said auto-generated GCG parameters; and

if discrepancies are found, modifying said auto-generated generic component shape identifier to provide a modified generic component shape identifier and adding said modified generic component shape identifier and said auto-generated GCG parameters to said CCL portion for said at least one CV/CAT#.

58. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of~~ claims 28 —57 and also comprising, following said employing said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line, assigning suitable variables to adaptive ones of said pick & place machine specific component data to provide pick & place machine specific component data which corresponds to a specific pick & place machine configuration for at least one pick & place machine in said pick & place machine line.

59. (Currently Amended) A method of manufacturing electronic circuits according to ~~any of the preceding~~ claims 1 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating does not require operator entry of pick & place machine-specific component data.

60-87. (Canceled)

88. (Original) Apparatus for manufacturing electronic circuits comprising:
a computerized electronic circuit data generator operative for generating CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and
a computerized generator operative for employing said CAD data, said bill of materials and said approved component vendor list for automatically generating:
a pick & place machine-specific component loading specification;
a pick & place machine-specific component placement sequence; and
pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line.

89. (Original) Apparatus for manufacturing electronic circuits according to claim 88 and wherein said computerized generator includes:
a first database containing at least one of pick & place machine-independent, geometric component data and pick & place machine-independent, component supply data; and
a second database containing machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data.

90. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~either of claims 88 and 89~~ and wherein said pick & place machine specific component data for governing the operation of at least one specific pick & place machine comprises at least one of pick & place machine-specific component shape parameters and pick & place machine-specific component supply parameters.

91. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 88 -90~~ and wherein said computerized generator is also operative for automatically generating a third database containing at least:
a mapping between component identifiers and pick & place machine-specific component shape parameters; and

a mapping between said component identifiers and pick & place machine-specific component supply parameters.

92. (Original) Apparatus for manufacturing electronic circuits according to claim 91 and wherein said mapping between component identifiers and pick & place machine-specific component shape parameters comprises:

a mapping of PCNs to component shape identifiers; and a mapping of component shape identifiers to pick & place machine-specific component shape parameters.

93. (Original) Apparatus for manufacturing electronic circuits according to claim 92 and wherein said component shape identifiers are pick & place machine-specific component shape identifiers.

94. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of~~ claims 91-93 and wherein said mapping between said component identifiers and pick & place machine-specific component supply parameters comprises: a mapping of PCNs to component supply identifiers; and

a mapping of component supply identifiers to pick & place machine-specific component supply parameters.

95. (Original) Apparatus for manufacturing electronic circuits according to claim 94 and wherein said component supply identifiers are pick & place machine-specific component supply identifiers.

96. (Currently Amended) Apparatus for manufacturing electronic circuits to ~~any of~~ claims 91-95 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters;

component handling parameters;
component imaging parameters;
component recognition tolerances; and
pick & place machine-specific procedures.

97. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of~~ claims 91-96 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters in pick & place machine-specific syntax;
pick & place machine-specific component handling parameters;
pick & place machine-specific component imaging parameters;
pick & place machine-specific component recognition tolerances; and
pick & place machine-specific procedures.

98. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of~~ claims 91-97 and wherein said pick & place machine-specific component supply parameters include at least one of:

a component carrier type; and
pick & place machine-specific, component carrier-specific parameters.

99. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of~~ claims 88-98 and wherein at least part of said pick & place machine-specific component data comprises adaptive pick & place machine-specific component data.

100. (Original) Apparatus for manufacturing electronic circuits according to claim 99 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component shape data.

101. (Original) Apparatus for manufacturing electronic circuits according to claim 99 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component supply data.

102. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 89-101~~ and wherein said first database comprises at least one of:

- a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);
- a mapping of CV/Cat#s to component supply form parameters (CCSL);
- a mapping of PCNs to component supply form parameters (UMCSL);
- a mapping of PCNs to CV/Cat#s (MCVL);
- a mapping of DCN to PCN;
- a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and
- a mapping of PCN to generic component geometric parameters.

103. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 89-102~~ and wherein said second database comprises at least one of:

- a mapping of component manufacturer-independent component characteristics to rules for generating pick & place machine-specific component shape parameters; and
- a mapping of component manufacturer-independent component supply form characteristics to rules for generating pick & place machine-specific component supply parameters.

104. (Original) Apparatus for manufacturing electronic circuits according to claim 103 and wherein said rules for generating pick & place machine-specific component shape parameters include rules for generating at least one of:

- component geometric parameters in pick & place machine specific syntax;
- pick & place machine specific component handling parameters;

pick & place machine specific component imaging parameters;
pick & place machine specific component recognition tolerances; and
pick & place machine specific procedures.

105. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~either of claims 103 and 104~~ and wherein said rules for generating pick & place machine-specific component supply parameters include rules for generating at least one of:

a component carrier type in pick & place machine-specific syntax; and
component carrier type-specific parameters in pick & place machine-specific syntax.

106. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 103 —105~~ and wherein said second database comprises at least one of:

a mapping of component manufacturer-independent component characteristics to rules for generating adaptive pick & place machine-specific component shape parameters; and
a mapping of component manufacturer-independent component supply form characteristics to rules for generating adaptive pick & place machine-specific component supply parameters.

107. (Original) Apparatus for manufacturing electronic circuits according to claim 106 and wherein said rules for generating adaptive pick & place machine-specific component shape parameters include rules for generating at least one of:

component geometric parameters in pick & place machine specific syntax;
adaptive pick & place machine specific component handling parameters;
adaptive pick & place machine specific component imaging parameters;
adaptive pick & place machine specific component recognition tolerances; and
pick & place machine specific procedures.

108. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~either of claims 106 and 107~~ and wherein said rules for generating adaptive pick & place machine-specific component supply parameters include rules for generating at least one of:

adaptive component carrier type in pick & place machine-specific syntax; and
adaptive component carrier type-specific parameters in pick & place machine-specific syntax.

109. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 103 –108~~ and wherein said second database is operator modifiable.

110. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 88 –109~~ and wherein said computerized generator includes:

a fourth database containing pick & place line and machine configurations.

111. (Original) Apparatus for manufacturing electronic circuits according to claim 110 and wherein said fourth database comprises at least one of:

pick & place machine configurations;
ordered listings of pick & place machines in a plurality of machine lines; and
pick & place machine configurations of said pick & place machines in said plurality of machine lines.

112. (Original) Apparatus for manufacturing electronic circuits according to claim 111 and wherein said pick & place machine configurations include at least one of:

camera types and characteristics;
illumination types and characteristics;
component feeder carriage types and characteristics;
component feeder types and characteristics;
nozzle types and characteristics; and
kinetic characteristics of moving elements.

113. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~either of claims 111 and 112~~ and wherein said pick & place machine configurations of said pick & place machines in said plurality of machine lines include at least one of:

- mounted camera types;
- mounted illumination types;
- mounted component feeder carriages;
- mounted component feeders; and
- mounted nozzles.

114. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 89 -113~~ and wherein said computerized generator comprises:

- computerized new component data searching functionality operative to employ said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components; and

- computerized auto-generation functionality operative to employ said first database and said second database to auto-generate said pick & place machine specific component data.

115. (Original) Apparatus for manufacturing electronic circuits according to claim 114 and wherein said computerized generator also comprises:

- a computerized combined printed circuit assembly data generator operative to employ said CAD data, said bill of materials and said approved component vendor list to form combined printed circuit assembly data;

- a computerized line selector operative to select a pick & place machine line;

- computerized line balancing functionality operative to employ said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line.

116. (Original) A method of manufacturing electronic circuits according to claim 115, and wherein said combined printed circuit assembly data employs PCN designations.

117. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 114-116~~ and wherein said computerized new component data searching functionality comprises:

computerized component supply data searching functionality operative to search said first database for pick & place machine independent component supply data for said new components; and

computerized component shape data searching functionality operative to search said first database for pick & place machine independent geometric component data for said new components.

118. (Original) Apparatus for manufacturing electronic circuits according to claim 117 and wherein said computerized component supply data searching functionality comprises:

a PCN selector operative to select at least one PCN corresponding to ones of said new components for which CSF parameters are not available;

CSF CV/CAT# obtaining functionality operative to obtain a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which CSF parameters are not available; and

CSF searching functionality operative to employ said CV/CAT# to search at least part of said first database for corresponding CSF parameters.

119. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~either of claims 117 and 118~~ and wherein said computerized component shape data searching functionality comprises:

a PCN selector operative to select at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

GCG CV/CAT# obtaining functionality operative to obtain a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

GCG searching functionality operative to employ said CV/CAT# to search at least part of said first database for corresponding GCG parameters.

120. (Original) Apparatus for manufacturing electronic circuits according to claim 119 and wherein said computerized component shape data searching functionality also comprises computerized proximity searching functionality, including:

first computerized searching functionality operative to search said first database for at least one additional PCN having at least one corresponding CV/CAT#, which is different from said CV/CAT#, in common with said at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

second computerized searching functionality operative to search said first database for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

proximate GCG parameter searching functionality operative to employ said at least one different CV/CAT# to search at least part of said first database for GCG parameters corresponding to said at least one different CV/CAT#.

121. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 114-120~~ and wherein said computerized auto-generation functionality comprises:

component supply parameter auto-generation functionality operative to employ said first database and said second database to auto-generate pick & place machine specific component supply parameters; and

component shape parameter auto-generation functionality operative to employ said first database and said second database to auto-generate pick & place machine specific component shape parameters.

122. (Original) Apparatus for manufacturing electronic circuits according to claim 121 and wherein said component supply parameter auto-generation functionality comprises:

a PCN selector operative, for a specific pick & place machine in said pick & place machine line, to select at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

CSF parameter obtaining functionality operative to employ at least one generic component supply identifier to obtain CSF parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

rules operating functionality operative to employ at least part of said CSF parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data and to operate said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said CSF parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

123. (Original) Apparatus for manufacturing electronic circuits according to claim 122 and wherein said component supply parameter auto-generation functionality also comprises component supply identifier auto-generation functionality operative to employ at least part of said CSF parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

124. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 121 —123~~ and wherein said component shape parameter auto-generation functionality comprises:

a PCN selector operative, for a specific pick & place machine in said pick & place machine line, to select at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

GCG parameter obtaining functionality operative to employ at least one generic component shape identifier to obtain GCG parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

rules operating functionality operative to employ at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data and to operate said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said GCG parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

125. (Original) Apparatus for manufacturing electronic circuits according to claim 124 and wherein said component shape parameter auto-generation functionality also comprises component shape identifier auto-generation functionality operative to employ at least part of said GCG parameters to auto-generate said corresponding pick & place machine specific component shape identifier.

126. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 114 —125~~ and also comprising a computerized database populating functionality operative to automatically populate a CCL portion of said first database.

127. (Original) Apparatus for manufacturing electronic circuits according to claim 126 and wherein said computerized database populating functionality also comprises component library which maps CV/CAT#s to component packaging shape parameters.

128. (Original) Apparatus for manufacturing electronic circuits according to claim 127 and wherein said component library comprises:

a first stage mapping which maps CV/CAT#s to component packaging shape identifiers; and

a second stage mapping which maps said component packaging shape identifiers to component packaging shape parameters.

129. (Original) Apparatus for manufacturing electronic circuits according to claim 128 and wherein said computerized database populating functionality comprises:

CV/CAT# obtaining functionality operative to obtain at least one CV/CAT# for which no mapping exists in said CCL portion;

component packaging shape identifier obtaining functionality operative to employ said first stage mapping to obtain a component packaging shape identifier corresponding to said at least one CV/CAT#; and

component packaging shape parameter obtaining functionality operative to employ said second stage mapping to obtain component packaging shape parameters corresponding to said component packaging shape identifier corresponding to said at least one CV/CAT#.

130. (Currently Amended) Apparatus for manufacturing electronic circuits according to ~~any of claims 114—129~~ and also comprising value assigning functionality operative to assign suitable variables to adaptive ones of said pick & place machine specific component data to provide pick &

place machine specific component data which corresponds to a specific pick & place machine configuration for at least one pick & place machine in said pick & place machine line.

131-149. (Canceled)